

# Exhibit 30

12844 1F Future Balance Sheet  
Statement from Shs  
written for Sven-  
Ernst Fins

APS3200 Bleed System  
In Service Review Meeting

# APS3200 Bleed System

Ed Edelman  
December 5, 1994

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HSA 226735

**Agenda / Overview**

**APS3200 Bleed System  
In Service Review Meeting**

**• Agenda / Overview**

- Bleed System Design Review
- Test Requirements
- $\Delta P/P$  Sensor Status
- V3.0 Schedule
- ECB Retrofit Program Schedule
- PCR Status
- Summary / Action Items

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**Bleed System Design  
Review**

**APS3200 Bleed System  
In Service Review Meeting**

**• Bleed System Design Review**

- Bleed System Overview
- Surge Fault Protection
- Reverse Flow Fault Detection
- Low Bleed Pressure during MES
- APU Bleed Dispatch Reliability
- Summary of Software and Hardware Changes

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**Problem Statement**

**APS3200 Bleed System  
In Service Review Meeting**

- Load Compressor Bleed System Control Problem Statement:
  1. Inadequate surge fault detection, leading to continuous surge with CEC-IMO sensor failures and eventually IGV bushing failure and APU replacement.
  2. No reverse flow detection, which may lead to APU failure upon A/C check valve failure.
  3. Low bleed pressure during MES, preventing main engine starts or resulting in hot main engine starts.
  4. Non-activation of bleed system (BCV full bypass) upon failure of BCV, IGV, delta P, P7, T7, T2 or P2, resulting in poor APU bleed system dispatch reliability.

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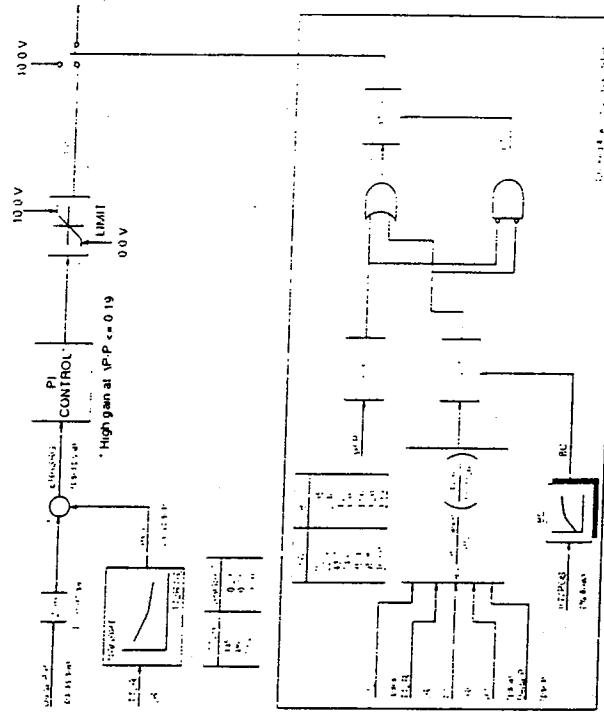
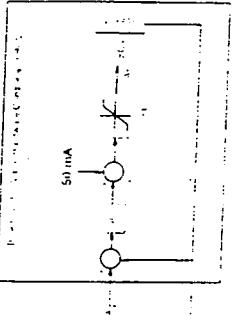
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## Overview of Bleed Control System

# APS3200 Bleed System In Service Review Meeting

- V2.6.8 Surge Control Overview (simplified)



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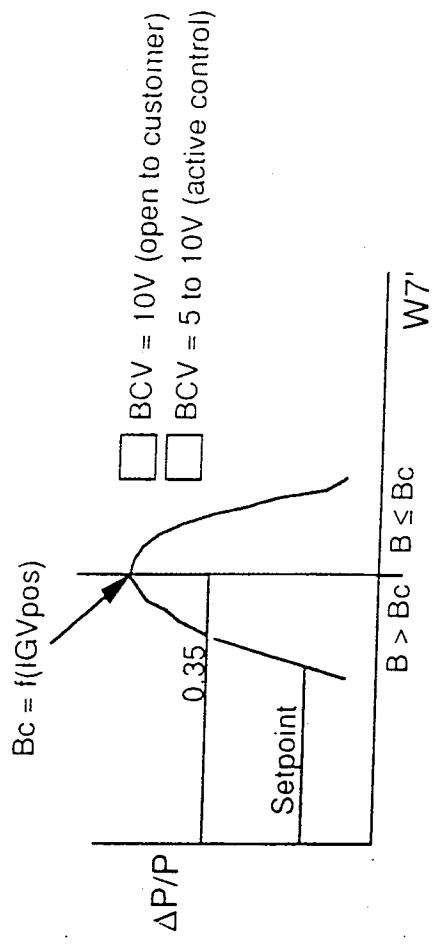
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## Overview of Bleed Control System

### APS3200 Bleed System In Service Review Meeting

- B-factor used to distinguish low vs. choked flow due to dual solution at  $\Delta P/P$  setpoint.



$$\text{B-factor Flow Prediction, where } B = \frac{P_{lcd} - \Delta P}{P_{inlet}} \left( \frac{T_{inlet}}{T_{lcd} - T_{inlet}} \right)$$

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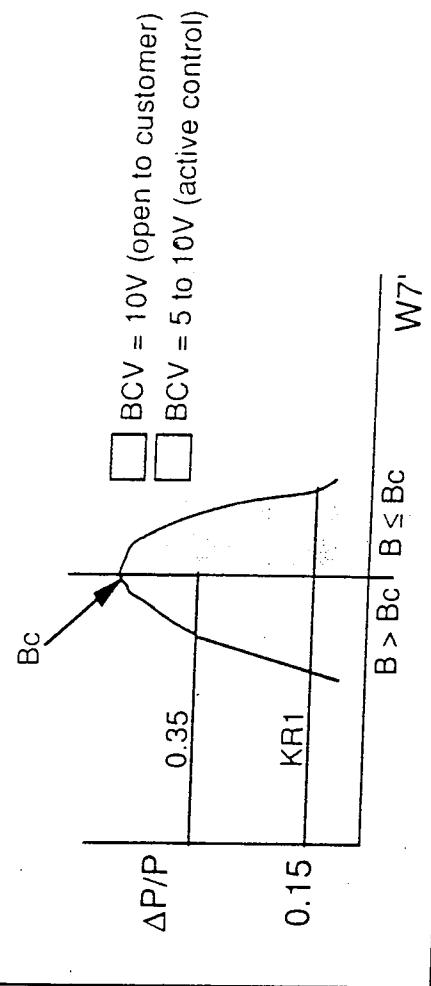
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## Surge Fault Detection

### APS3200 Bleed System In Service Review Meeting

#### • Existing Fault Detection Logic

Delta P/P < KR1 (surge limit exceeded) removed during development program due to false fault declarations associated with B-factor Miscalculation due to Tlcd transient behavior.

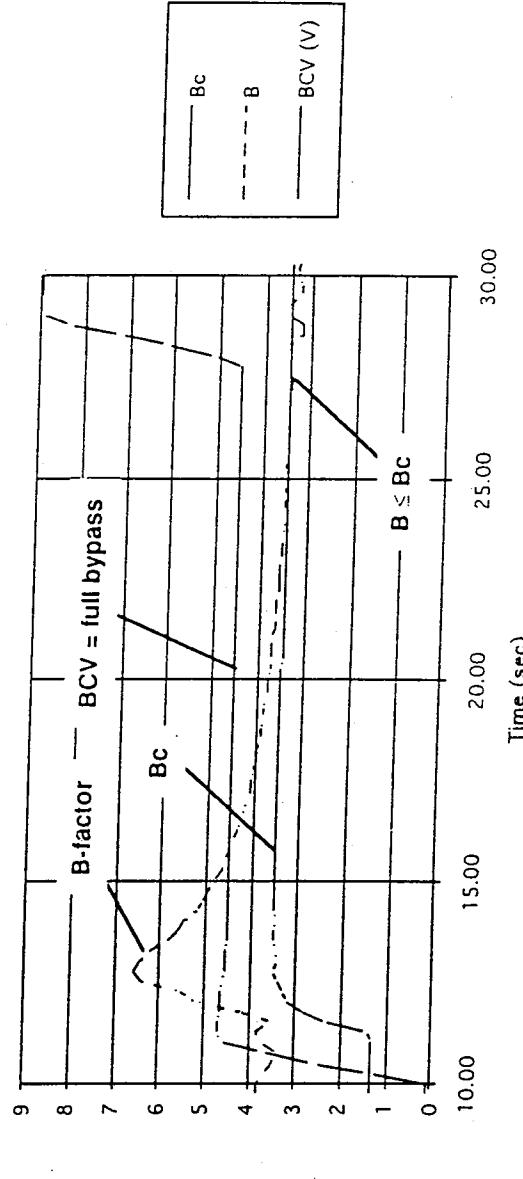


## Surge Fault Detection

## APS3200 Bleed System In Service Review Meeting

- Load Compressor Discharge Sensor Dynamics Results in Miscalculation of B-factor (continued)

B-factor, BCVpos vs. Time for ECS Valve Transient



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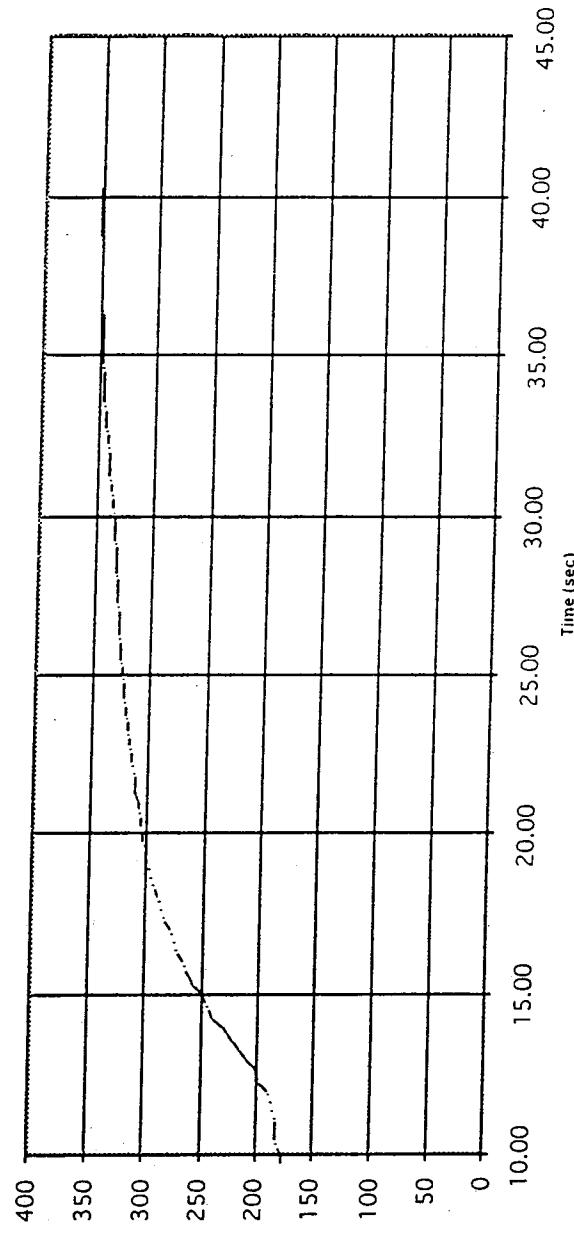
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**Surge Fault Detection,  
continued**

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**• Load Compressor Discharge Sensor Dynamics Results  
in Miscalculation of B-factor**

LCDT vs. Time for MES Transient  
(Tau = 7.75 sec)



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**Surge Fault Detection,  
continued**

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- **Proposed fault detection logic isolates surge based on rate of change of P7 and Rate of change of Delta P. Two fault classes:**

- Single surge event due to control system undershoot.
- Continuous surge (4 surges in 15 seconds) due to negative surge system margin (IMO sensor failure).

Fault Description (RS232 Message)	SSL	Fault Cause (L RU)	APU Operation (Impact)
LC Surge	4	None	None
Surge Limit Exceeded	4	None	None
Continuous LC Surge	4	LCP Transducer	Bleed System Deactivation
Continuous LC Surge and BCV Mechanically Failed Open	2	LCP Transducer	APU Shutdown
Reverse Flow	4	A/C Check Valve	Bleed System Deactivation
Reverse Flow and BCV Mechanically Failed Open	2	LCP Transducer or A/C Check Valve	APU Shutdown

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**Surge Fault Detection,  
continued**

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- **Several surge detection methods considered:**

Proposed Surge Detection	Pros	Cons
Move inlet pressure/temperature sensor to load compressor side of inlet plenum	Pressure rise and temperature rise provide accurate surge and reverse flow detection method.	Requires hardware change in addition to software modification
Replace slow response T7 with fast response T7 $\Delta P/P \leq 0.15 \text{ psid/psia}$ .	Temperature rise can be used to detect surge and continuous surge.	Requires hardware change and must be used in conjunction with pressure measurement.
Rate of Change of $\Delta P$ and Rate of Change of P7.	Simple and reliable software solution if sensor measurements are accurate	<ul style="list-style-type: none"> <li>Requires <math>\Delta P</math> and P7 input filter change in ECB hardware to improve frequency response (currently 5 Hz).</li> <li>Sensor measurement shifts may result in non-detection.</li> </ul>

**Rate of change of  $\Delta P$  and rate of change of P7 selected as best method**

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## Surge Fault Detection, continued

### APS3200 Bleed System In Service Review Meeting

- Surge system margin tolerance stack-up (surge margin = 0.05 psid/psia)

- Problem areas include CEC/IMO out-of-tolerance pressure transducers and transient undershoot due to 5 Hz.  $\Delta P$  and  $P7$  input filter.

Surge Margin Contribution	Margin (h) (psid/psia)	System Margin (h) (psid/psia)	System Margin (Worst Case) (psid/psia)
Engine Deterioration	*	*	*
Sensor Variation	0.013 <sup>8</sup>	0.043 <sup>9</sup>	
Sensor Variation, Ambient Temperature Effects	0.005 <sup>11</sup>	0.005	
ECB Component Variation	0.013 <sup>1,2,3,4</sup>	0.038 <sup>1,2,3,5</sup>	
Software Resolution	0.0002 <sup>1</sup>	0.0002	
Steady-state Margin	0.024 <sup>10</sup>		
Control Undershoot	0.016 <sup>6</sup>	0.028	
ECB Input Filter Undershoot	0.032 <sup>7</sup>	0.01	
Total of Transient Undershoot	0.053	0.029	
Sum of Steady-state and Transient Undershoot	0.077		

\* Information currently not available

1 Assumes worst-case calculation error for  $\Delta P$  and  $P7$  ( $\Delta P = 12$  psid,  $P7 = 55$  psia) and  $P7$  is 100% of  $P7$   
 2 Assumes operating point of  $\Delta P/P7 = 11$  psid and  $P7 = 55$  psia, in a typical MES operating condition, Sea level, Std/Std/Std Day  
 3 Input amplifier, gain resistor, MUX, and conversion error, input and A/D conversion offset error. Based on -40 °C to +90 °C operating range. Based on component manufacturer tolerances  
 4 Individual errors are RSS values  
 5 Assumes worst case in summation of individual errors  
 6 Based on M/S valve transient, M/S valve closure = 0.9 sec. Test performed on M/S valve transient, worst case result  
 7 Input filter = 4 Hz for 25 Hz filter, undershoot = 0.018 psid  
 8  $P7$  based on operating point of 56 psia. Represents 10 distribution, mean = 56.42 psia. Population of seven sensors.  $\Delta P$  based on operating point of 10 psid. Represents 10 distribution, mean = 10.13 psid, population of 8 sensors. 1 psid  
 9 Worst case variation based on S/N 580015 and S/N 580023  
 10 Measured  $\Delta P = 7.5$  psid,  $P7 = 48$  psia  
 11 RSS of sensor variation, ECB component variation and sum of software resolution, sensor temperature effects  
 12 Test performed on one sensor at  $\Delta$  ambient = 240 °F

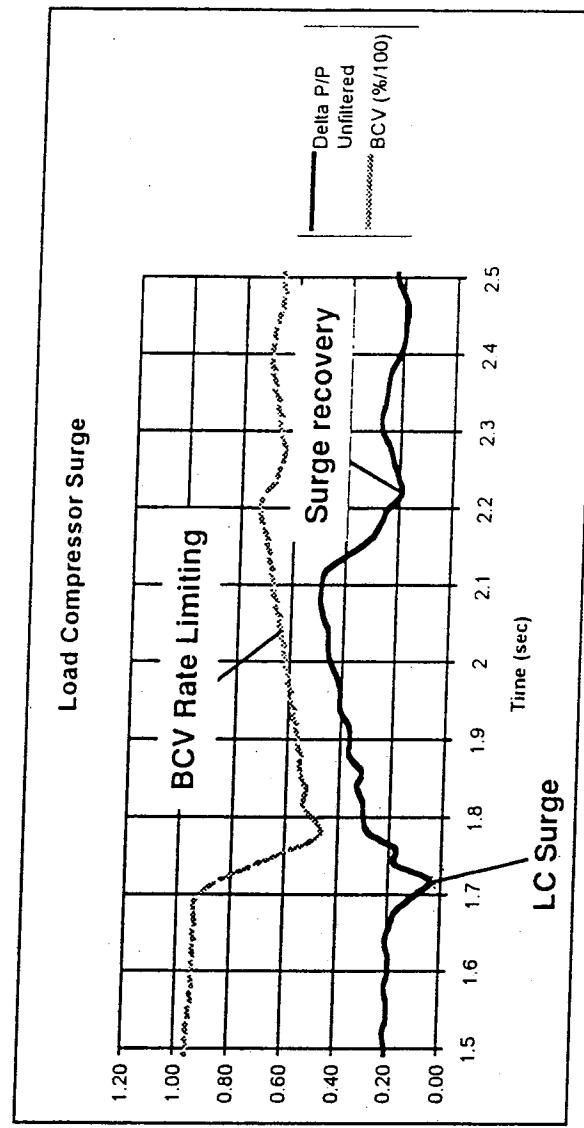
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**Surge Fault Detection,  
continued**

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- Single surge event due to transient undershoot. Surge control recovers due to unidirectional BCV rate limit.



\* Test performed with 250 msec. facility valve and non representative volume.  
Surge cannot be duplicated in Tail section without lowering setpoint.

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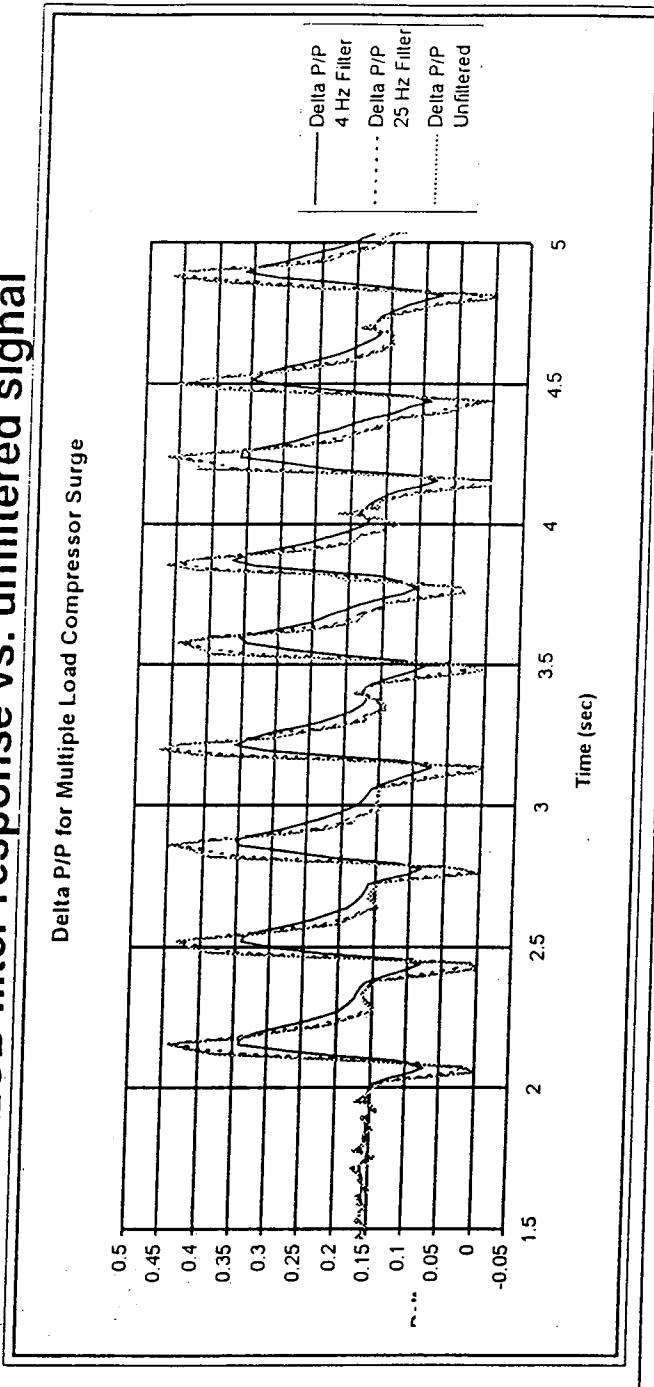
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## Surge Fault Detection, continued

### APS3200 Bleed System In Service Review Meeting

- Continuous surge induced at Turbomeca by disabling bleed system (BCV removed).

- 4 Hz. ECB filter response vs. unfiltered signal



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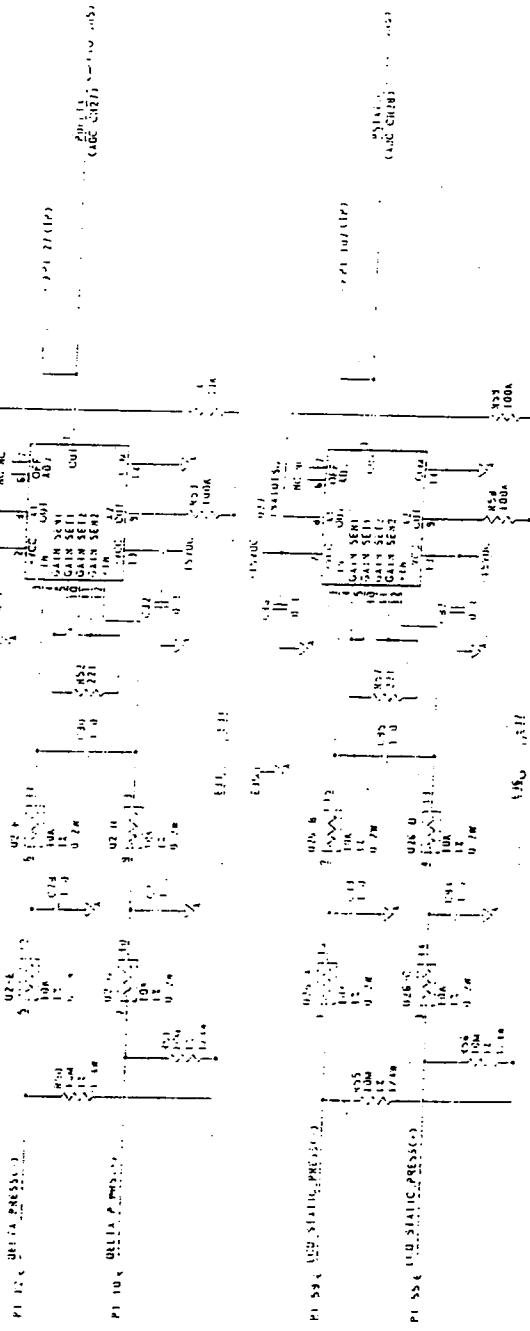


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## Surge Fault Detection, continued

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$$G(s) = \frac{1}{(\tau_s + 1)(4\tau_s + 1)}$$

Existing:

$$\begin{aligned}
 U2-E &= U2-F = U2-G = U2-H = 10 \text{ k}\Omega \\
 C &= C78 = C79 = C80 = 1.0 \mu\text{F} \\
 f &= 4,16 \text{ Hz}
 \end{aligned}$$

Proposed:

$$\begin{aligned}
 U2-E &= U2-F = U2-G = U2-H = 10 \text{ k}\Omega \\
 C &= C78 = C79 = C80 = 0.25\mu\text{F} \\
 f &= 16, 64 \text{ Hz}
 \end{aligned}$$

Proposed:

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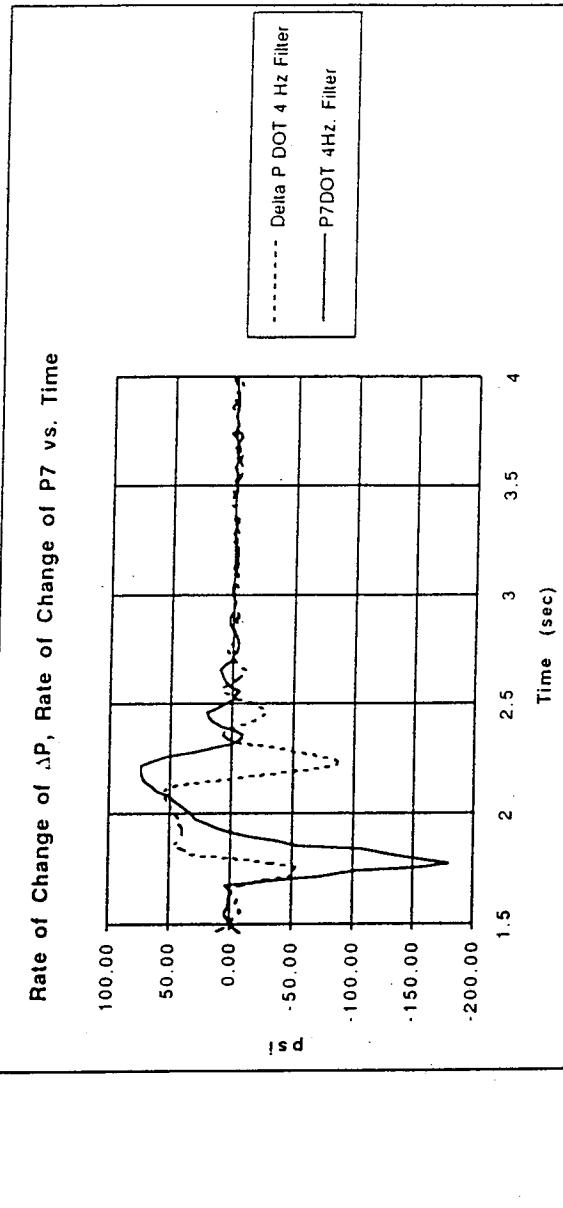
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**Surge Fault Detection,  
continued**

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- Surge detected based on rate of change of  $\Delta P$  and rate of change of LCDP.
  - “Soft” sensor failure does not compromise surge detection



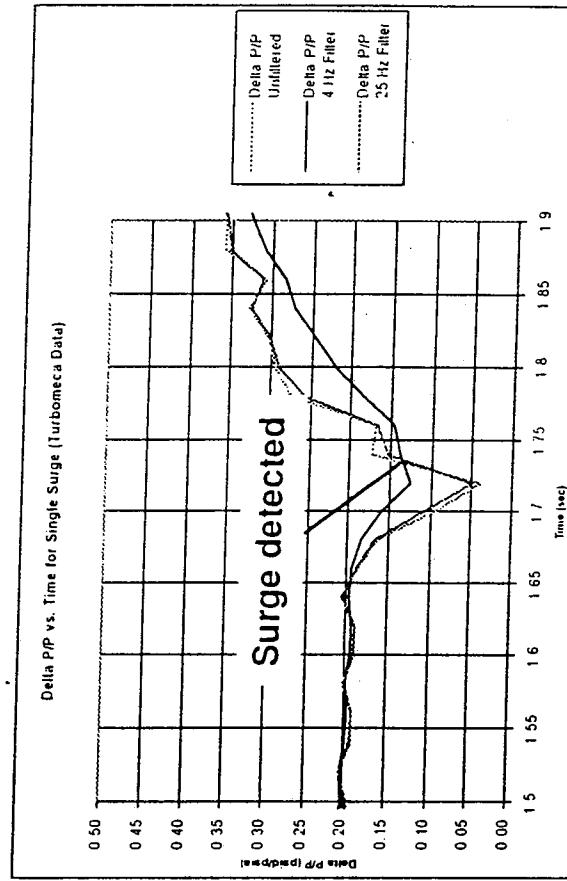
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**Surge Fault Detection,  
continued**

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- **4-Hz. hardware filter effects fault detection based on  $\Delta P/P$  alone.**



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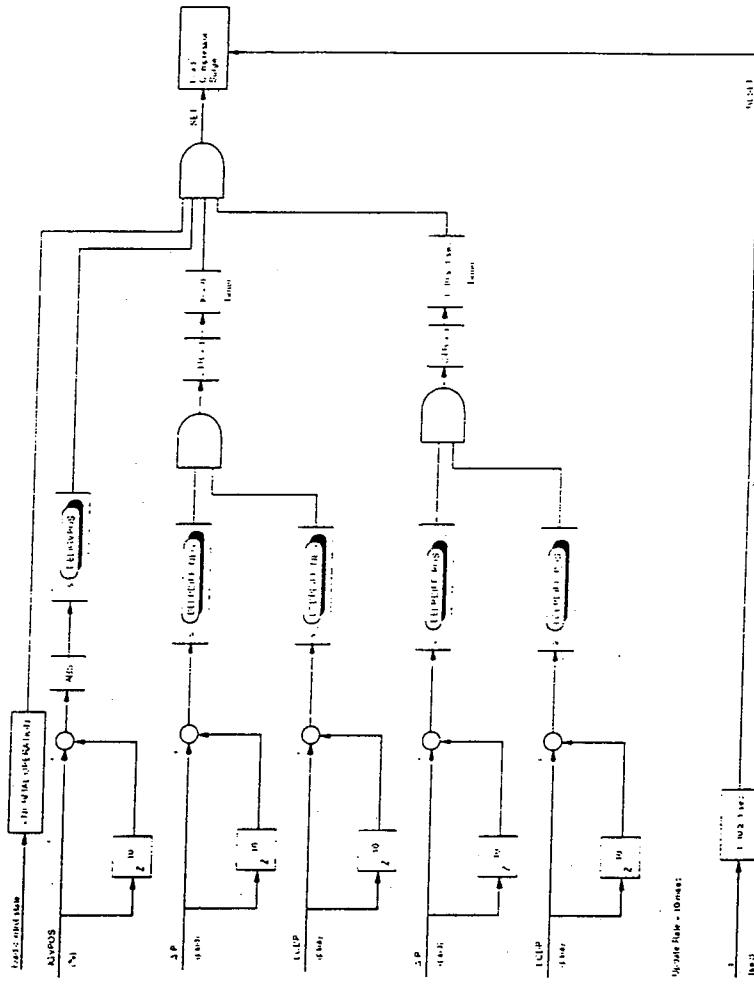
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## Surge Fault Detection, continued

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- Load Compressor surge detection based on rate-of-change of  $\Delta P$  and  $\Delta P/P$ .



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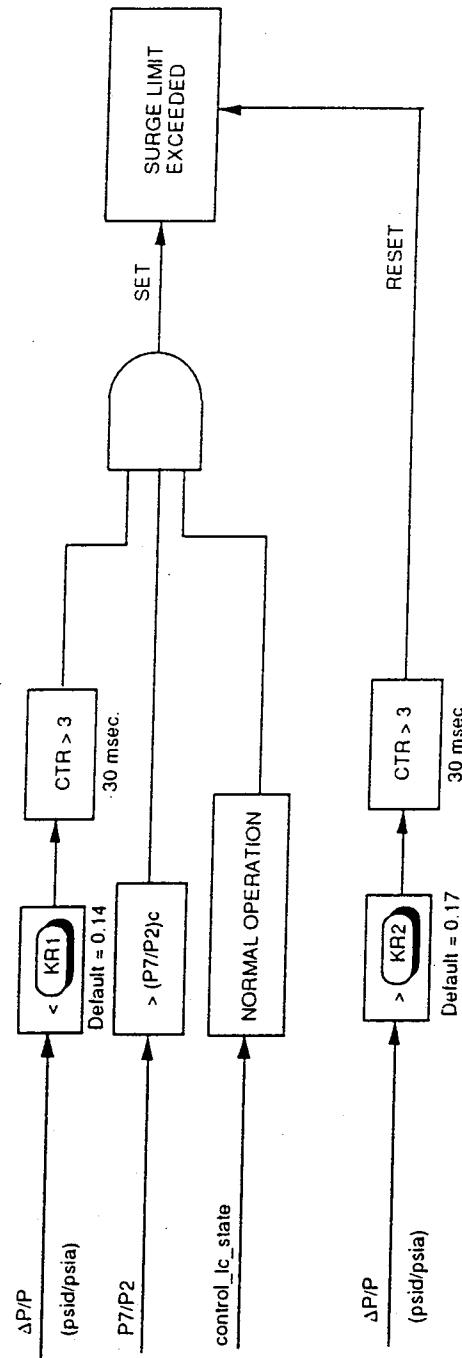
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**Surge Fault Detection,  
continued**

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- Surge limit exceeded dependent on  $\Delta P/P$  level.



Update Rate = 10 msec.

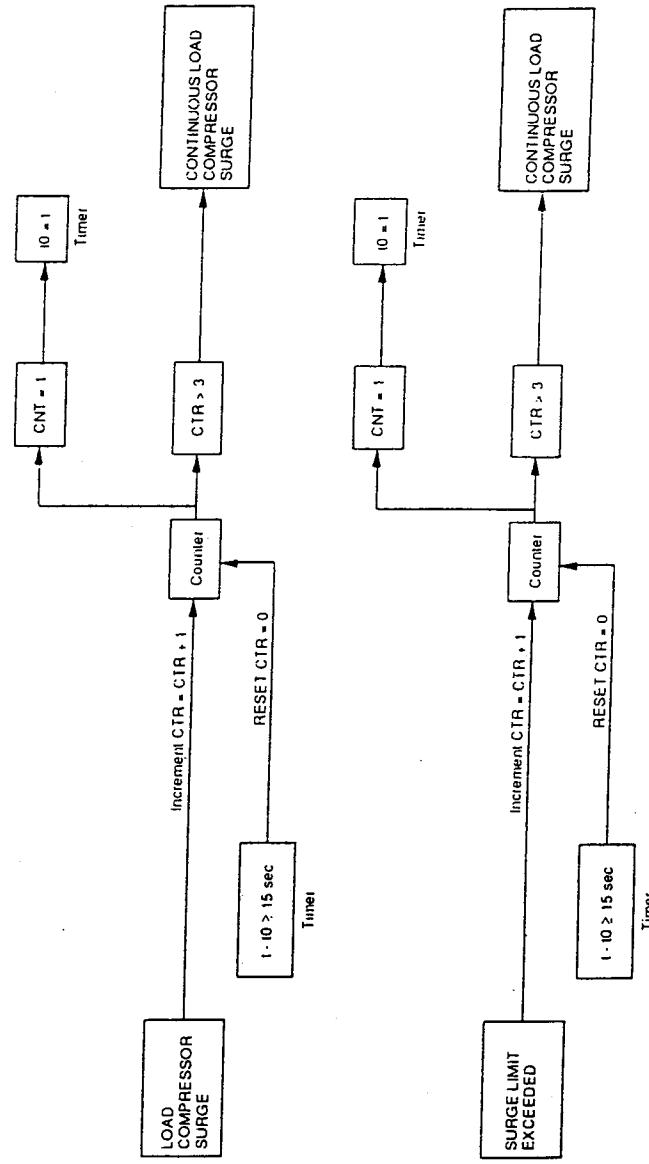
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## Surge Fault Detection, continued

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- Continuous surge detected if four consecutive surges occur within 15 sec., resulting in disabling of bleed system.



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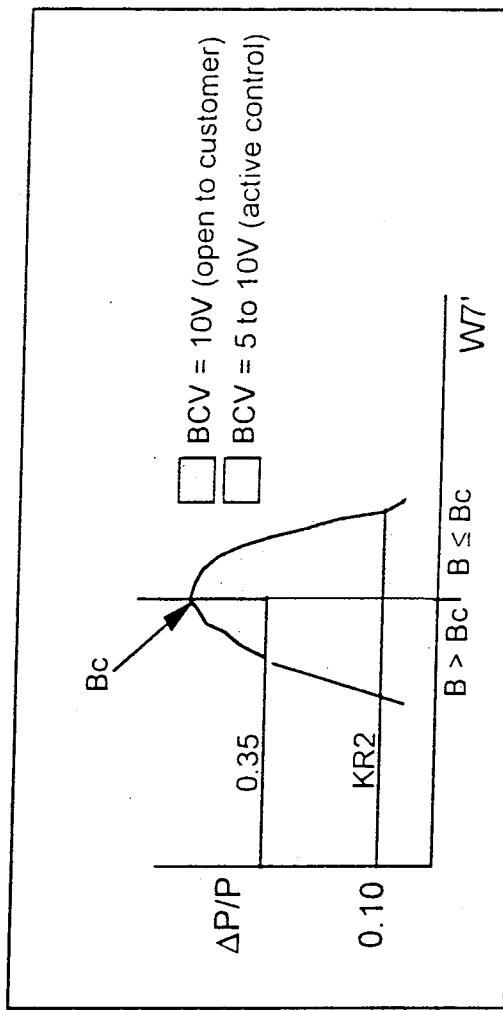
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## Reverse Flow Fault Detection

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- **V2.0.2 Fault Detection Logic**
  - Delta P/P < KR2 (reverse flow) removed during development program due to false fault declarations associated with B-factor Miscalculation

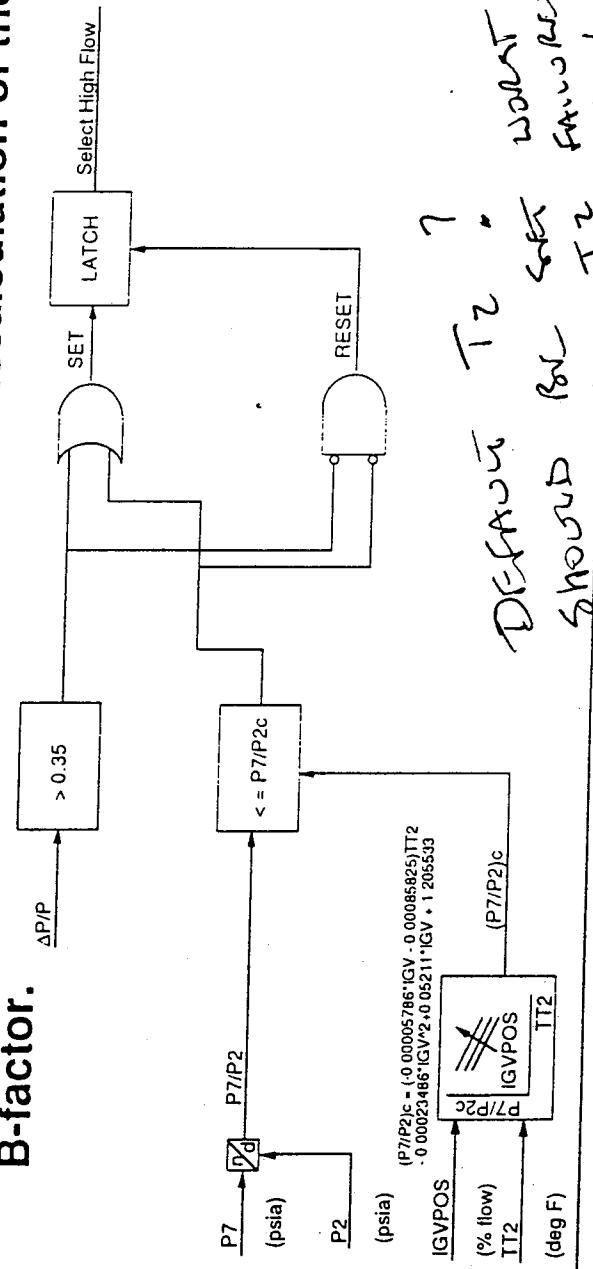


## Reverse Flow Fault Detection

### APS3200 Bleed System In Service Review Meeting

#### • V3.0 Reverse Flow Fault Detection

- B-factor replaced with Load Compressor Pressure Ratio (P7/P2)c to eliminate Load Compressor Discharge Temperature Dynamic Effects and miscalculation of the B-factor.



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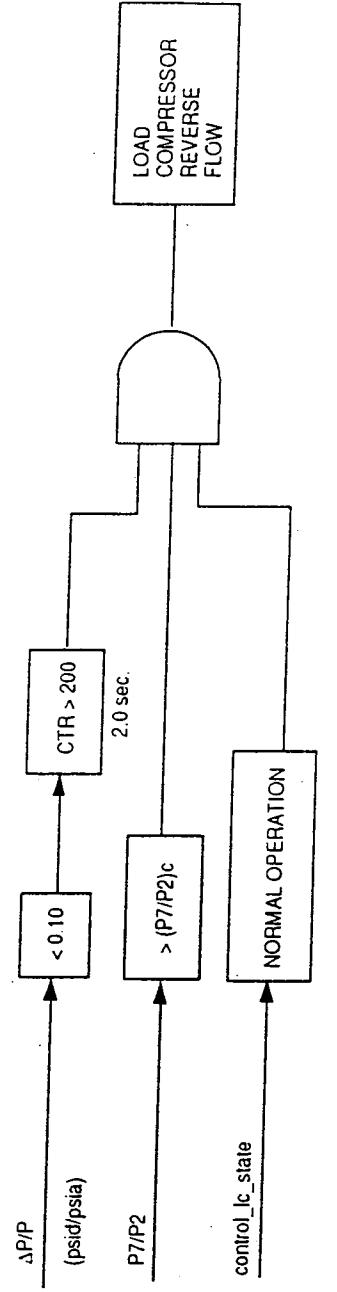
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## Reverse Flow Fault Detection, continued

### APS3200 Bleed System In Service Review Meeting

- **Proposed fault detection logic isolates reverse flow**
  - Replacement of B-factor with Load Compressor Pressure Ratio (P7/P2)c eliminates nuisance shutdowns due to LCDT sensor dynamics and miscalculation of the B-factor.



**Low Bleed Pressure  
during MES**

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- **Low bleed pressure during MES. Pilot observes bleed pressure less than 10 psia during Main Engine Start.**
  - Problem not linked to BMC power interrupt of load command signal.
    - » 130 msec interrupt not sufficient to interrupt air flow due to IGV and BCV rate limiting during bleed sequencing off.
  - Problem may be linked to BMC “lock-up” problem.
    - » BMC can continuously command 10V signal when lock-up occurs (normally 0 V = bleed on / 15 V = bleed off). Deadband in ECB (4.25 V positive going threshold, 8.0 V negative going threshold) permits bleed off command during BMC lock-up.

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**Low Bleed Pressure  
during MES, continued**

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**• Low bleed pressure during MES, continued**

- Problem *may* be due to simultaneous opening of ECS and MES valves, unique to the V2500 main engine.
  - » 4-5 second overlap of ECS and MES signals may result in unexpected high flow condition and false fault declaration of delta P sensor.

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**Low Bleed Pressure  
during MES, continued**

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- **Low bleed pressure during MES, continued**
  - Known problem due to B-factor miscalculation, delta P sensor false fault declaration (recorded during A/C ground test)
    - » B-factor miscalculation due to T7 sensor dynamics results in temporary full-bypass flow.
    - » High flow condition results in deltaP false fault declaration ( $\Delta P < 1.75$  psid)

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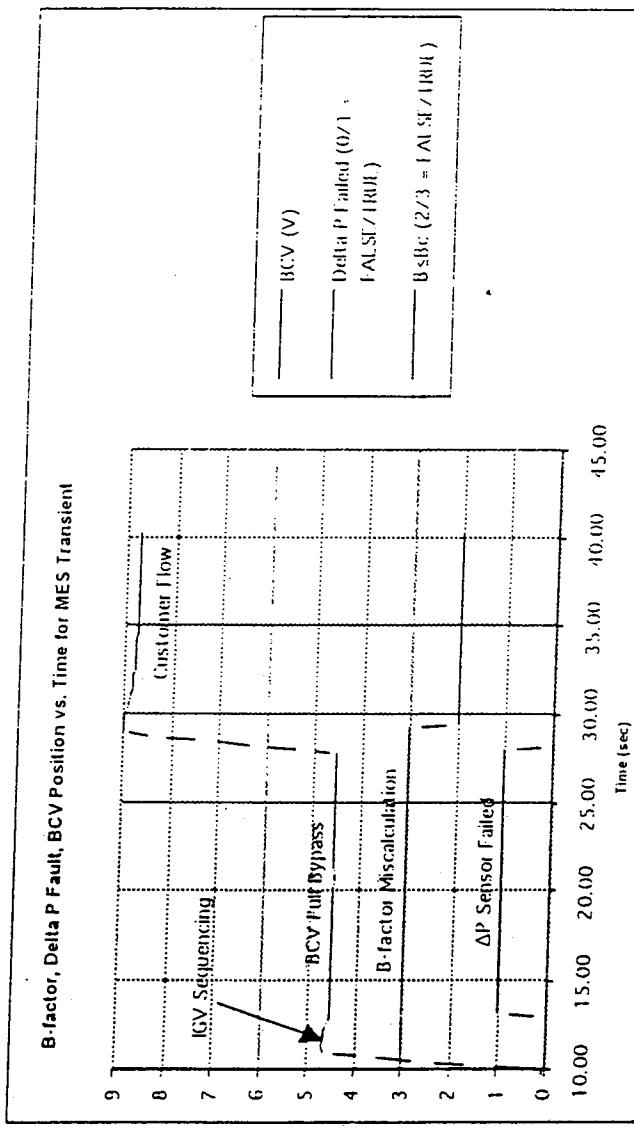
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## Low Bleed Pressure during MES, continued

### APS3200 Bleed System In Service Review Meeting

- B-factor miscalculation, delta P sensor false fault declaration results in full bypass flow



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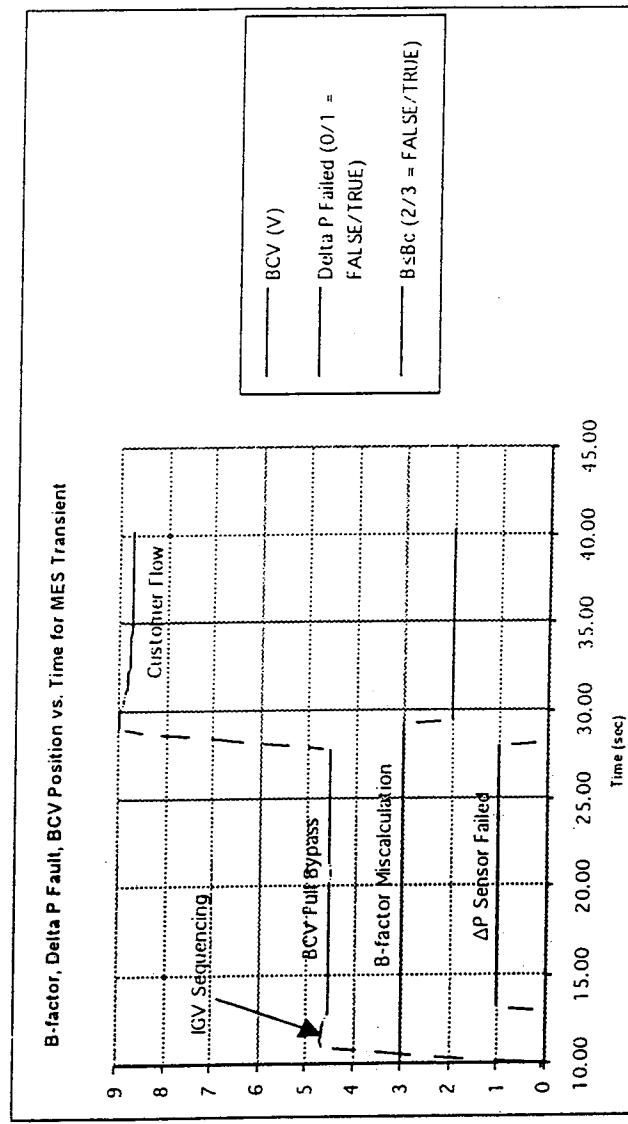
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## Low Bleed Pressure during MEs, continued

### APS3200 Bleed System In Service Review Meeting

- B-factor miscalculation, delta P sensor false fault declaration results in full bypass flow



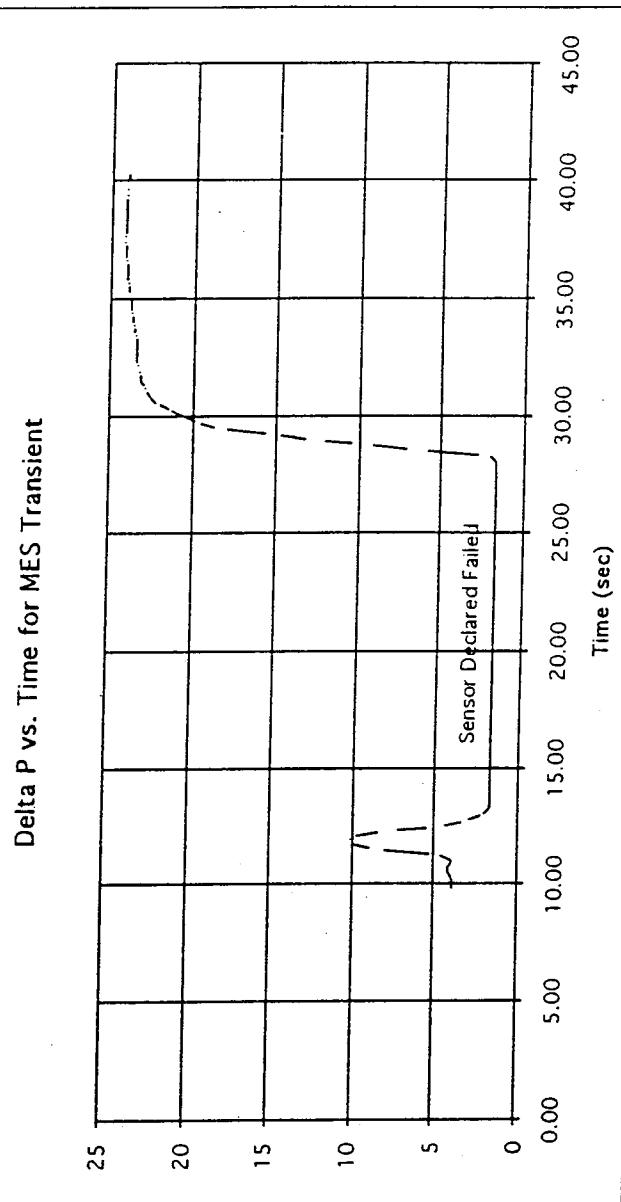
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**Low Bleed Pressure  
during MES, continued**

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- **Delta P sensor false fault declaration contributed to  
Full Bypass Flow**



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Low Bleed Pressure during MES, continued	APS3200 Bleed System In Service Review Meeting
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- **Low bleed pressure during MES Solution:**
  - Replace B-factor (a function of T7) with LC Pressure Ratio (P7/P2)c
  - Reduce delta P fault indication from 1.75 psid (7% of full-range output) to 0.875 psid (3.5% of full-range output) to account for simultaneous MES and ECS demand or BCV full bypass during MES.

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**APU Bleed System  
Dispatch Reliability**

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- Version 3.0 improves bleed system dispatch reliability
  - B-factor replaced with load compressor pressure ratio, eliminating LCDT sensor control requirement
  - Tinlet and Pinlet use LCDT and LCDP upon failure *what?*

Transducer	V2.0.2	V3.0
Pinlet	●	●
Tinlet	●	●
LCDP		
LCDT	●	●
LC $\Delta$ P	●	●

- No effect on BCV
- Requires dual sensor failure before bypassing bleed (BCV = 50%)
- Bypasses bleed flow (BCV = 50%) upon sensor failure.

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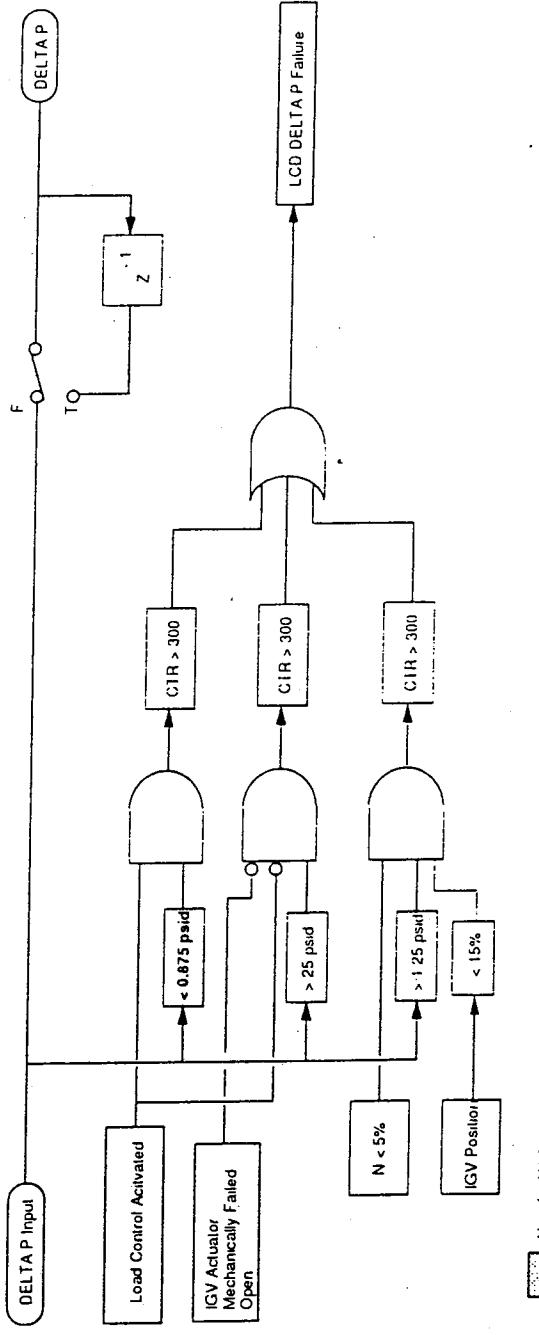
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## APU Bleed System Dispatch Reliability

### APS3200 Bleed System In Service Review Meeting

- Load Compressor  $\Delta P$  transducer fault logic



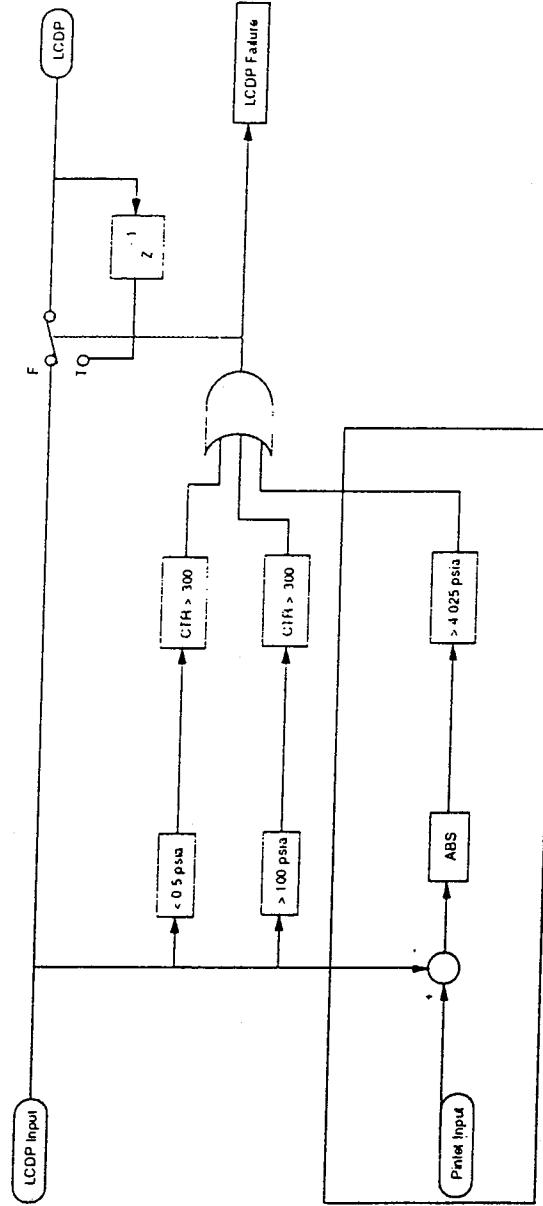
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## APU Bleed System Dispatch Reliability

### APS3200 Bleed System In Service Review Meeting

#### • Load Compressor Discharge Pressure Transducer Fault Logic



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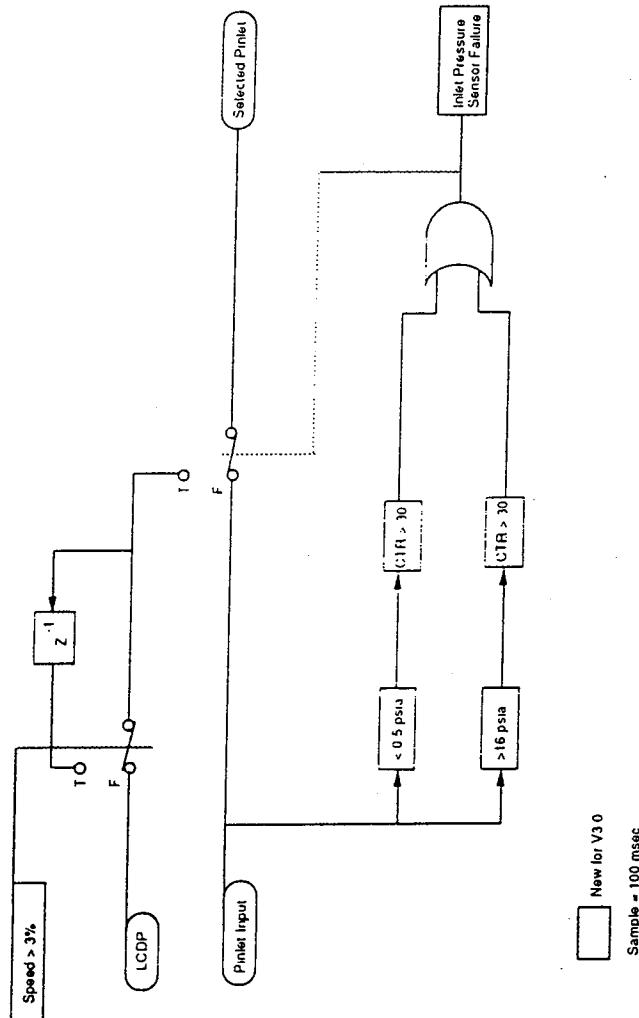
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## APU Bleed System Dispatch Reliability

# APS3200 Bleed System In Service Review Meeting

- ## Inlet Pressure Transducer Fault Logic for Bleed System



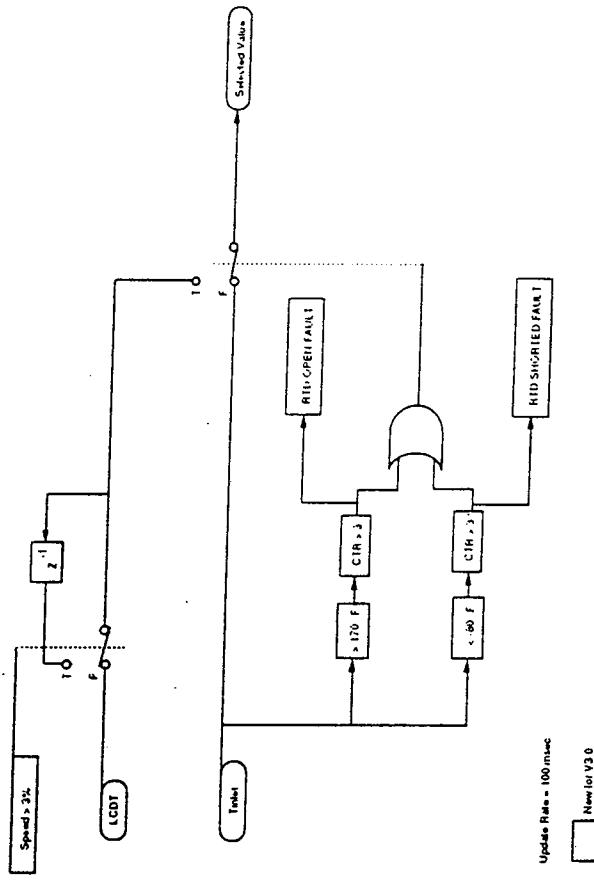
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## APU Bleed System Dispatch Reliability

# APS3200 Bleed System In Service Review Meeting

- Inlet Temperature Transducer Fault Logic for Bleed System



A hand-drawn graph on a grid background showing a linear relationship between two variables. The x-axis is labeled "Wheat" and the y-axis is labeled "Oats". The graph shows a line starting at approximately (0, 10) and ending at approximately (400, 300).

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<b>Summary of Hardware and Software Changes</b>	<b>APS3200 Bleed System In Service Review Meeting</b>
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<b>Summary of Hardware and Software Changes</b>	<b>APS3200 Bleed System In Service Review Meeting</b>
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- **Summary of Proposed Changes**

- **V3.0 Software Changes**
  - » Choked flow predictor change (P7/P2)c
  - » Surge fault detection
  - » Reverse flow fault detection
  - » 7% range check on Pinlet and Pstatic sensors
  - »  $\Delta P$  logic modification to prevent false fault declaration during high flow conditions
  - » Pinlet and Tinlet fault logic for improved dispatch reliability
- **ECB input filter on  $\Delta P$  and P7 change from 4 Hz. to 15-25 Hz.**

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Testing Requirements	APS3200 Bleed System In Service Review Meeting
	<ul style="list-style-type: none"><li>• <b>Testing Requirements</b><ul style="list-style-type: none"><li>- <u>Development Testing:</u> Low Bleed Pressure during MES, surge fault protection with and without <b>faulty sensor</b>, testing of dispatch reliability logic, reverse flow logic.</li><li>» Low Bleed Pressure during MES, including testing of the (P7/P2)c at all bleed conditions.</li><li>» Surge fault detection, including compatibility with the faulty CEC-IMO sensor.</li><li>» Testing with and without the ECB filter modification.</li><li>» Reverse flow tests with a pressurized MES bleed duct.</li><li>» Dispatch mode reliability (test sensor failures), including the affects of soakback on LCDT.</li></ul></li><li>- <u>Software Validation:</u><ul style="list-style-type: none"><li>» Functional validation will be conducted prior to flight test to ensure proper control and safety related operation. In addition, lessons learned during V2.0.3 will be added to the test program, ensuring proper software replacement. Complete validation will be performed on V3.0.</li></ul></li></ul>

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## APS3200 Bleed System In Service Review Meeting

- **Testing Requirements (continued)**

- Software Throughput Tests will be performed during HSIT, engine test and aircraft test. Design goal = 10%.
  - ” Software task monitoring (in V2.6.8) provides an accurate accounting of throughput margin. Testing with worst-case ARINC traffic will be conducted, which exceeds the requirements observed on the aircraft with V2.6.8. All tasks in all phases of operation will meet the goal of 10% throughput margin.
- HSIT Test
  - ” The complete HSIT test will be conducted, including a detailed throughput analysis.
- Compatibility Test
  - ” The pneumatic portion of the compatibility test will be conducted prior to aircraft testing.
- Safety Test
  - ” Required prior to aircraft testing.
- Software/APU Integration Test
  - ” This test insures the integrity of the control system and software by exercising all of the control loops, maximizing software throughput, testing NVM by adjusting parameters and exercising all of the operating states.

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To Court Order

**HSA 226772**

**Auxiliary Power International Corp.**  
A Joint Company of Labinai And Sundstrand Corp.



**APS3200 Bleed System  
In Service Review Meeting**

**• Testing Requirements (continued)**

- Aircraft Compatibility Tests. Validation of the software will be conducted during a two month evaluation period on the aircraft. Included in the tests will be:
  - ” Low Bleed Pressure during MES.
  - ” Proper bleed operation throughout the flight envelope.
  - ” Surge fault detection, including compatibility with the faulty CEC-IMO sensor.
  - ” Software throughput margin.
  - ” Check valve failure (reverse flow) test.

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**HSA 226773**

**Auxiliary Power International Corp.**  
A Joint Company of Labinai and Sundstrand Corp.

**APIC**

12/4/94

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$\Delta P/P$ Sensor Status	APS3200 Bleed System In Service Review Meeting
<ul style="list-style-type: none"><li>• Dual suppliers - CEC/IMO and Kulite</li><li>• CEC/IMO had manufacturing defect<ul style="list-style-type: none"><li>– Resulted in positive shift in measured <math>\Delta P/P</math>, resulting in continuous APU surge</li><li>– Six engines removed due to continuous surge</li></ul></li><li>• Kulite - no operational failures to date<ul style="list-style-type: none"><li>– Retrofit of CEC/IMO sensors with Kulite<ul style="list-style-type: none"><li>» SB 4500001-49-23 Complete 1st Quarter of 1995</li></ul></li><li>– Evaluating stress screening of sensor<ul style="list-style-type: none"><li>» Vibration, temperature, pressure</li></ul></li></ul></li></ul>	

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To Court Order

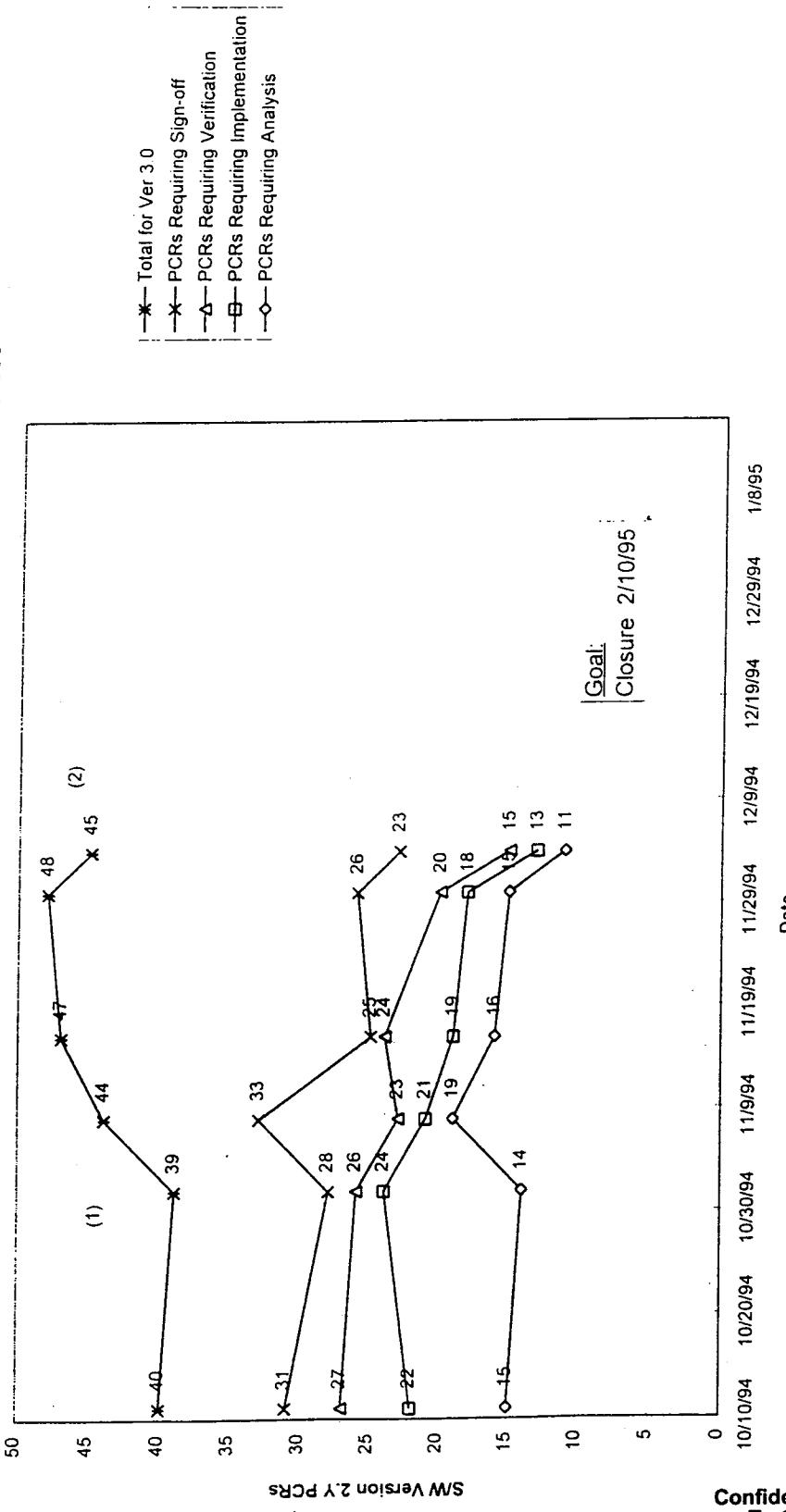
HSA 226774

## EECB DELTA P / P HARDWARE FILTER UPGRADE SCHEDULE ISSUE 1

**Confidential Pursuant  
To Court Order**

HSA 226775

## APS3200 PCR STATUS FOR S/W VERSION 3.0

Confidential Pursuant  
To Court Order

HSA 226776

# Exhibit 31

IN THE UNITED STATES DISTRICT COURT

DISTRICT OF DELAWARE

HONEYWELL INTERNATIONAL, INC., )  
and HONEYWELL INTELLECTUAL )  
PROPERTIES, INC., )  
Plaintiffs,

vs.

HAMILTON SUNDSTRAND CORP., )  
Defendant.

No. 99-309-GMS

VIDEOTAPED DEPOSITION OF JIM CROCKER CLARK  
Volume 1 (Pages 1- 278)

Phoenix, Arizona

December 6, 2005

10:00 a.m.

PREPARED FOR:

District Court  
(Original)

PREPARED BY:

Robin L. B. Osterode, RPR, CSR  
AZ Certified Reporter No. 50695

<p>134 1 good person to call?</p> <p>2 A. I don't think he would know either; he 3 couldn't tell you specifically either, I don't think.</p> <p>4 Q. How did -- describe for me the logic in 5 the 331-350 where IGV position was used to determine 6 whether the double solution issue existed?</p> <p>7 A. Can you repeat the question?</p> <p>8 Q. Describe for me the logic in the 331-350 9 that used inlet guide vane position to determine 10 whether the double solution issue existed?</p> <p>11 A. Yeah, I think I already replied to that.</p> <p>12 There's a -- I believe there's a schedule in there, 13 it's got inlet guide vane position and pressure 14 inputs, and it makes a decision on which side of the 15 curve you're on.</p> <p>16 Q. Does it compare inlet guide vane position 17 to a pressure ratio?</p> <p>18 A. Does it compare inlet guide vane position 19 to a pressure ratio?</p> <p>20 Q. In this schedule.</p> <p>21 A. The inputs to the schedule, I think, are, 22 if I recall my memory, is in inlet guide vane 23 position and then there's some pressure, some --</p> <p>24 Q. Why does the double solution problem 25 occur in the 331-350?</p>	<p>136 1 problem, don't you need two static pressure 2 measurements, two static pressure ports?</p> <p>3 A. No, you can have a total in static.</p> <p>4 Q. So in the -- in any APU that uses the 5 Delta P/P flow-related parameter, if the static 6 pressure measurement in that parameter is taken in 7 the diffuser and if you get supersonic flow in the 8 diffuser, you'll experience the double solution 9 problem?</p> <p>10 MS. STEVENSON: Objection; asked and 11 answered several times.</p> <p>12 THE WITNESS: Any time you get supersonic 13 flow in the diffuser, you get a distortion to that 14 curve.</p> <p>15 BY MR. LIND:</p> <p>16 Q. The double solution curve?</p> <p>17 A. It makes the double solution curve.</p> <p>18 Q. Do all of the Honeywell APUs you listed 19 earlier that use the Delta P/P flow-related parameter 20 take the static pressure measurement in the diffuser?</p> <p>21 MS. STEVENSON: Object to the form.</p> <p>22 THE WITNESS: The 331s -- the 331s all 23 do, I believe.</p> <p>24 BY MR. LIND:</p> <p>25 Q. The 331-200, therefore --</p>
<p>135 1 A. Because the static ports were put down in 2 the diffuser.</p> <p>3 Q. So any time you put static pressure ports 4 in the diffuser, you can exhibit -- and you get 5 supersonic flow in the diffuser, you'll experience 6 this double solution problem?</p> <p>7 A. Yes, that's right.</p> <p>8 Q. Where are the static ports in the 9 331-50-- I'm sorry, where are the static pressure 10 ports within the 331-350 diffuser?</p> <p>11 A. I don't know where they are exactly, 12 they're down -- they're in the diffusers and I don't 13 know the location, that was -- if that was the 14 question.</p> <p>15 Q. Yes, sir.</p> <p>16 And is -- when you're -- the 331-350 uses 17 your Delta P/P flow parameter in its surge control 18 system, correct?</p> <p>19 A. That's correct.</p> <p>20 Q. So my understanding of the Delta P/P 21 flow-related parameter is that it is total pressure 22 minus static pressure over total pressure, correct?</p> <p>23 A. It's total pressure minus static 24 pressure, that quantity over total pressure.</p> <p>25 Q. In order to get the double solution</p>	<p>137 1 A. I'm sorry, the 331-200 and 250 do not 2 have static taps in the diffuser; it's out in the 3 duct.</p> <p>4 Q. Is the difference between the control -- 5 surge control logic to the 331-200 and the 331-350 be 6 the location of the static pressure taps, then?</p> <p>7 A. That's correct.</p> <p>8 Q. Why did you move the static pressure tap 9 from the duct in the 331-200 to the diffuser in the 10 331-350?</p> <p>11 A. I don't know all the reasons, but I know 12 one reason was to get a larger Delta P signal, which 13 we previously discussed.</p> <p>14 Q. Because there's an advantage to having 15 the static pressure measurement in the diffuser, as 16 opposed to out in the duct?</p> <p>17 A. There's advantages and disadvantages and 18 that's one of the advantages.</p> <p>19 Q. And Honeywell recognized that advantage 20 in changing the surge control logic between the 21 331-200 and the 331-350, correct?</p> <p>22 A. That was a recognized advantage.</p> <p>23 Q. And when did Honeywell recognize the 24 advantage of measuring surge -- measuring static 25 pressure in the diffuser, as opposed to the duct?</p>